# Motivational interviewing to improve adherence behaviours for the prevention of diabetic foot ulceration

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*Published in:*
Diabetes/Metabolism Research and Reviews

*DOI:*
10.1002/dmrr.3105

*Publication date:*
2019

*Document Version*
Author accepted manuscript

**Full Title:**

# Motivational interviewing as an intervention to improve adherence behaviours for the prevention of diabetic foot ulceration – a systematic review.


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**Running Title:** **Motivational interviewing and diabetic foot ulceration. A systematic review.**

**Date:** **1st Nov 2018**

Manuscript word count: 3742 words

Abstract word count: 249 words

Number of tables and figures : 4

Number of references: 55

# Motivational interviewing as an intervention to improve adherence behaviours for the prevention of diabetic foot ulceration – a systematic review.

**Abstract.**

Diabetic foot ulceration is a major complication associated with high morbidity. Little evidence exists on which interventions are effective at preventing ulceration. Participants who are adherent to self-care behaviours have significantly better outcomes. Motivational interviewing is an intervention that has been used successfully for conditions where adherence is important, such as reduction of obesity and HbA1c levels.

A systematic review was conducted to determine whether motivational interviewing is effective at improving adherence for the prevention of Diabetic Foot Ulceration. Electronic searches were run without date or language restrictions in MEDLINE (viaEBSCOhost), CINAHL (viaEBSCOhost), ProQuest (Health & Medical Collection, Nursing & Allied Health Database, PsycINFO, Psychology, PsychArticles), AMED, EMBASE, Cochrane Central Register of Controlled Trials, ScienceDirect, and Web of Science Core Collections. Papers were included if participants had or were at risk of diabetic foot ulceration. Studies required motivational interviewing or a motivational approach as the sole intervention or as a component. Randomised controlled trials and quasi-experimental studies were included if ulceration and/or at least one behavioural outcome was measured before and after the intervention.

Five studies met the inclusion criteria. Heterogeneity prevented the pooling of data. One study used motivational interviewing as the sole intervention. This study found a short term positive effect on footwear adherence. The remaining four studies had a motivational component within their interventions. Two of these studies showed the intervention to be effective but both were at a high risk of bias. This review demonstrates an evidence gap. More research is needed.

## Keywords

Diabetes, Diabetic Foot, Motivational Interviewing, Systematic Review, Prevention, Patient Education, Adherence, Behaviour.

## Introduction

Diabetic foot ulceration continues to be a major complication associated with high morbidity, mortality and societal costs [1,2]. Diabetic foot ulceration affects 15-20% of people with diabetes with a yearly incidence between 2-4% [1,3,4]. The recurrence rate is reported to be 40% within 1 year after ulcer healing, almost 60% within 3 years, and 65% within 5 years [4]. Foot ulceration places a substantial financial burden on healthcare systems and society with an estimated 0.6% of U.K. National Health Service Expenditure attributed to diabetic foot care [5,6] .

The pathway to ulceration through sensory neuropathy, foot deformity and / or peripheral vascular disease is well known [4]. However insufficient evidence exists on which preventative interventions are effective. Only a small number of relevant studies are available which are highly varied in their aims, quality and outcomes[1,2,7,8]. Studies investigating the impact of patient education have mostly focused on traditional approaches designed to improve self-care by increasing patient's knowledge and skills [1,2,7,8]. Patient education remains a cornerstone of practice despite strong evidence showing it has minimal effect on ulceration rates [1,2,7,8]. Clinicians continue to deliver traditional education in the absence of alternative approaches to enhance adherence and without the ability to identify the 10-15% of patients for whom traditional approaches are effective [14].

Adherence is defined as the extent to which a person's behaviour corresponds with agreed recommendations from a health care provider [9]. Behavioural change and adherence for those at risk of developing diabetic foot ulceration includes wearing prescribed footwear, daily checking of feet for signs of impending ulceration, not walking barefoot to avoid accidental injury, attendance at foot-care appointments and home foot temperature monitoring. There has been recent interest on whether interventions focused on improving one or a number of adherence behaviours is a stronger predictor of efficacy for the prevention of ulceration [4,10]. Evidence from intervention studies have confirmed that patients who are adherent to one or more of these behaviours have significantly better outcomes [4]. Effect sizes range from 58 to 98% for stratified adherent groups with a mean improvement in effectiveness across all interventions of 49.8% when compared to non-adherent participants [4].

However adherence in people at risk of diabetic foot ulceration is consistently reported as low [2,10-12]. Within the same population, self-efficacy (confidence) and knowledge on risks and prevention is often high [1,13]. It therefore follows that people at risk of ulceration may be well aware of the risks, know how to prevent it, and are confident in what they are able to do, yet these factors are not always sufficient for them to make and sustain the adherent behaviours required to prevent ulceration. Reasons for this remain unclear but it is accepted in behavioural research that 'knowing' does not translate into 'doing' [12]. It is also accepted that the lack of pain perception resulting from neuropathy removes the feedback loop that may prompt an individual to adopt behaviours to avoid harm. It maybe that extrinsic prompts to support adherence is more effective in this population e.g. the use of phone apps, or daily diaries to increase behaviours such as daily checking of feet and wearing offloading devices.

Few studies exist that explore mechanisms of adherence for improved health outcomes for complex conditions such as diabetic foot disease where the required behaviours are numerous, individual and changeable. Adherence studies for the prevention of diabetic foot ulceration have mostly focused on wearing prescribed footwear as the target behaviour [11,14,15]. Studies have explored whether adherence was associated with duration of diabetes, history of ulceration, amputation status, foot deformity, body mass index, activity levels, living alone, employment, education level, attractiveness of footwear and beliefs about effectiveness of footwear [11,14]. There is conflicting evidence on associations between adherence and most of these factors; however findings suggest gender, diabetes duration and ulcer history are not predictors of adherence [14]. It is acknowledged that there is insufficient consideration of social and environmental factors on adherence in these studies [14].

Within other fields, researchers have explored interventions that focus on maximising individual's adherence. Adherence behaviour is likely to occur if it is important enough (level of motivation); if someone has the knowledge and skills to do it, confidence to perform it, and no serious environmental constraints to prevent performance [16]. Motivational interviewing is an intervention designed to enhance behaviour change specific to the individual and has been used successfully across a range of conditions including addictions, obesity, diabetes, and musculo-skeletal care [17-21]. Motivational interviewing utilises various change and counselling techniques and outperforms traditional patient education methods where behaviour change or adherence is the desired outcome [22]. The use of motivational interviewing has been suggested as an intervention for those at risk of diabetic foot ulceration due to poor foot outcomes being linked to poor self-care [23]. A systematic review of the literature was therefore conducted to determine whether motivational interviewing has been found to be an effective intervention to improve adherence behaviours for the prevention of diabetic foot ulceration.

## Materials and methods

**Search Strategy**

A systematic literature search was conducted by one investigator (JB) in November 2017 to identify articles that measured the impact of motivational, behavioural, counselling, adherence, compliance or self-care approaches on behavioural outcomes and/or the incidence of diabetic foot ulceration. Behavioural outcomes may have included the frequency of self-management practices, attending appointments, or duration of wearing prescribed footwear. It was expected that some studies would report these behavioural outcomes as endpoints and others may investigate whether the behaviours led to any differences in ulceration rates. Both behavioural and ulceration as end outcomes were included in this review. Electronic searches for peer reviewed articles were run without date or language restrictions in MEDLINE (viaEBSCOhost), CINAHL (viaEBSCOhost), ProQuest (Health & Medical Collection, Nursing & Allied Health Database, PsycINFO, Psychology, PsychArticles), AMED, EMBASE, The Cochrane Central Register of Controlled Trials, ScienceDirect, and Web of Science Core Collections. All database searches were limited to adults.

The search terms adopted were "diab* foot" OR "diab* feet" combined with the Boolean operator AND for each of the following: "motivational interviewing", "motivational enhancement therapy", "behaviour", "self-care", "counselling", "patient education", "adherence", and "compliance" (appendix 1) Relevant MESH terms for each database were used. A full description of the adaptations and search strategies is available in appendix A. All spelling versions were added into searches e.g. behaviour and behavior, counselling and counseling.

**Study Selection and Data Extraction**

Studies were included if participants had diabetes of any type, were aged 18 years or older and were classified as 'at risk' of developing diabetic foot ulceration as defined by the International Working Group on the Diabetic Foot [2]. Populations with current or recurrent ulceration and those with a co-existing risk factor such as renal failure were included. Studies were required to have motivational interviewing or a motivational approach as the sole intervention or as an intervention component. In order to be deemed as using a motivational approach, studies needed to describe one or more elements of the two domains, (Table 1) [24-26].

**Table 1. Motivational components of interventions required for inclusion.**

Studies with interventions solely aimed at improving knowledge and skills (traditional education) were excluded from the review including those based on lectures, presentations, use of leaflets, hand-outs and demonstrations. Technology and web-based interventions based on imparting information or knowledge were also excluded. Studies were incorporated irrespective of the duration, frequency and timing of intervention delivery. All types of control intervention were accepted including studies without comparator groups as long as the study was prospective with a 'before and after' study design. Studies were eligible for inclusion if they included a new episode of ulceration as an outcome and/or at least one behavioural outcome measure. No restriction was placed on the type of behavioural measure (self-reported or objective).

All relevant titles identified from the database searches, from 'snowballing' of other's references and from the grey literature were exported to RefWorks© where duplicate records were removed. Full copies of potentially eligible studies were obtained. Using Covidence© on-line software two review authors (JB and RB) independently assessed eligibility for inclusion. For studies where the reviewers assessment differed; further discussion led to agreement without the need for a third reviewer. Data across the studies relating to baseline characteristics of the participants, study designs and outcomes was recorded.

**Quality Assessment and Data Analysis**

Eligible studies were assessed by one author (JB) using a 21-point checklist designed to identify bias and quality [27]. The checklist was devised in recognition that existing quality and risk of bias tools do not fully meet the quality assessment needs of trials investigating diabetic foot disease [27]. It is accepted that for educational based interventions it is not always possible to blind participants or research personnel to the intervention. Assessment on adequate blinding included whether researchers were blinded to the outcomes and whether participants were

completing questionnaires and measurements independently of research personnel. Blinding and completeness of outcome data was assessed for each reported outcome.

The effectiveness of the intervention to change behaviours and/or reduce ulceration was analysed per study. In addition, an analysis of intervention content was conducted by one author (JB) using the Behavioural Change Taxonomy (BCTTv1). The BCTTv1 comprises of 93 distinct behavioural change techniques categorised into 16 domains [28,29]. Use of the BCTTv1 has been found to be a reliable method for specifying and interpreting behavioural change techniques within interventions [28-30]. It cannot be assumed that the same behavioural techniques are used within interventions designed to improve motivation. The identification of the active component in behavioural interventions is required in order to identify which approaches are most effective across studies and also for reproducibility of the techniques[29].

## Results

A total of 361 articles were retrieved using the detailed search strategy (Fig 1). Two reviewers (JB, RB) independently assessed 47 potentially eligible articles and achieved complete agreement on the inclusion / exclusion of 45 studies. Two studies required further discussion by the reviewers and agreement on their inclusion / exclusion was easily reached. Using evidence-based criteria (Table 1), five studies met the inclusion criteria (Fig 1).

**Fig 1. A PRISMA diagram for numbers of studies identified, screened, reviewed and selected.**

### Quality Assessment

Three out of five studies [31-33], demonstrated a very high risk of bias in key areas of study design, conduct and reporting (Table 2). One study had a moderate risk of bias [13], and the remaining exploratory study with ten participants had a low risk of bias [34].

**Table 2. Quality Assessment for Selected studies**

### Study design, populations and heterogeneity

Of the five studies included in the review, one was an RCT [32], three were pilot studies [13,31,34], and one was a quasi-experimental design [33]. Participants across the studies were comparable in demographic factors such as age and duration of diabetes but were not sufficiently similar in other key characteristics (Table 3). The studies differed in their aim, mode, duration of intervention delivery and outcomes (Table 3).

**Table 3. Characteristics of included studies**

### Analysis of intervention content and effect.

The heterogeneity across studies prevented the pooling of data to determine treatment effect. Analysis of content was conducted using a validated taxonomy of behavioural change techniques (Table 4) [28-30].

**Table 4. Analysis of behavioural interventions used in studies as categorised against the BCTTv1** http://www.bct-taxonomy.com/ [30].

Four of the five studies had a motivational component within their intervention as opposed to using motivational interviewing as a sole intervention. These four studies were assessed to have behavioural techniques from three of the sixteen domains; Goals and Planning, Social Support and Natural consequences, (Table 4). Natural consequences as a domain, includes the provision of information about health consequences, e.g. the likely consequence of ulceration if prescribed footwear is not worn. The fifth study by Keukenkamp et al. [34], was the only study which used motivational interviewing as a sole intervention and demonstrated sixteen behavioural change techniques across ten domains (Table 4).

Two of the five studies found their interventions to be ineffective [13,32]. The study by Gershater et al. [32] was the only study that had incidence of ulceration as an outcome and found that the intervention did not improve ulceration rates compared to the control group. McBride et al [13] found wound healing rate, adherence to treatment, self-efficacy and decision regret were not improved as a result of an intervention aimed at decision efficacy.

Although three studies out of five found interventions to be effective; two were assessed as being at very high risk of bias [31,33]. The study by Corbett [31] on a housebound population demonstrated improved effectiveness of self-care behaviours and self-efficacy following an intervention based on problem solving, social support and information. The study by McMurray et al. [33] on participants with end stage renal disease found that the intervention was effective at improving self-management behaviours, knowledge, quality of life, glycaemic control, foot risk and amputations after one year.

The remaining study by Keukenkamp et al. [34] was a case based investigation on ten subjects which demonstrated that the five subjects who received motivational interviewing had improved adherence from 49% to 84% at week one compared to controls. By three months however the adherence had returned to baseline levels. The control group adherence did not change from baseline at week one (35%) or at three months (33%). Due to the low number of subjects the results did not reach statistical significance.

## Discussion

Research on educational approaches to prevent diabetic foot ulceration has previously focused on knowledge, skills and care provision [7,35]. The lack of efficacy of education within many of these studies is to be expected as increasing knowledge and skills has been shown to be an unsuccessful approach to enhance behavioural change for improved health outcomes [36]. The World Health Organisation reports that studies that improve adherence lead to significant cost-savings and increased effectiveness of health interventions [9]. Motivation is recognised as a key factor to enable behavioural change and adherence [16,37]. It is surprising therefore that using a broad search strategy, this systematic review found just five studies on motivational / behavioural approaches for the prevention of diabetic foot ulceration. This review confirms an evidence gap in this area.

Generalisability of the research findings has been prevented by studies being insufficiently powered and/or demonstrating poor external validity and bias. Two of three studies that

demonstrated intervention effectiveness were carried out on small populations of renal dialysis and housebound participants, respectively [31,33]. These populations do not share characteristics with the broader population of participants at risk of diabetic foot ulceration. Furthermore, both studies did not report how potential confounders were controlled with the possibility that additional behavioural support could have taken place between participants in the dialysis unit [33] or with visiting home care staff [31].

The study by Keukenkamp [34] demonstrated that motivational interviewing was successful at changing behaviours on a short term basis for participants who required objective feedback on their behavioural performance. This finding is consistent with research that shows that additional interventions and techniques are often required to maintain behaviour over time [38]. The study by Keukenkamp [34] also showed that the intervention was unsuccessful for resistant participants whose barriers to change appeared to be belief based. These findings could be attributed to normal variation within a population whereby even in positive trials on motivational interviewing a certain proportion of participants do not respond to the approach [24,25].

Alternatively, evidence suggests that the mechanisms of delivery for motivational interviewing can affect its efficacy [25,26]. The intervention in the Keukenkamp study [34] was protocol driven with the same approach delivered to every individual within one session (except one participant). A technical 'one size fits all' approach has been found to limit the effectiveness of motivational interviewing particularly with participants who are most resistant to change [25]. An individual's motivation to adhere to a behaviour may be influenced by attitudes, environmental constraints, emotional responses, anticipated outcomes of behaviour, perceived control over outcomes, societal norms, knowledge and skills, and socioeconomic constraints [16,38-40]. Specifically diabetic foot ulceration is known to be associated with socio-economic deprivation, poor cognitive capability, poor wellbeing and depression [41-43]. Further exploration of these potential barriers to adherence may have been required in the Keukenkamp study [34] before moving onto goal setting with participants in a single session.

The broad search strategy adopted across a wide range of databases in this review may have been expected to identify a range of interventions within motivational, behavioural, counselling, or self-care paradigms. However, only the study by Keukenkamp et al. [34] had a varied number, type and description of techniques that could be aligned to theory [30,44]. Four out of five studies had very few behavioural change techniques described and all were focused around the same three domains (Table 4). It may be that the authors of these studies did not fully describe the interventions and underpinning theory within their work [29].

This systematic review did not include telemedicine, telehealth or mobile health apps as interventions within its search criteria. The use of telemedicine is reported within participants with diabetic foot ulceration but its use has been directed toward ulcer detection and management; such as wound assessment via video conferencing, or the use of mobile devices for thermal imaging [48,49]. However telemedicine for the prevention of ulcer recurrence through motivational and behavioural change techniques has yet to be reported in the literature.

By contrast video and telephone based motivational interviewing and mobile health apps to provide behavioural prompts and feedback have been used successfully to change behaviours in other populations. These populations include those with diabetes and long term conditions that require sustained adherence behaviours [50-53]. The use of technology to support behaviours is of particular relevance when considering that the cognitive abilities of those who have diabetic foot ulceration are reduced [42]. Mobile devices can play a significant role in prompting and motivating behavioural change where there is a reduced cognitive capacity and a decreased ability to concentrate [54,55].

Although this review has demonstrated that there is insufficient evidence to support motivational interviewing to improve adherence in this population, its efficacy in other conditions suggests that further research is warranted [18-20,45]. Studies have demonstrated motivational interviewing to effectively enhance adherence to physical activity, healthy eating, alcohol intake and medication adherence to improve control of long term conditions such as hypertension, diabetes or HIV [9,38,46,47]. The measurement of effectiveness in these studies is facilitated by having clearly defined behavioural or physiological targets based on evidence of efficacy, for example known levels of physical activity to reduce risk. This level of specificity is not known or possible for the numerous behaviours that may contribute to diabetic foot ulceration for an individual.

Studies on motivational interviewing demonstrate its flexibility as an intervention as one or several behavioural techniques per individual can be adopted whilst ensuring that the empathetic spirit and person-centred ethos of motivational interviewing is maintained [25]. This toolbox approach allows a technique to be selected based upon participant's individual characteristics and motivations [25]. To this effect, future research may select pragmatic trial designs in order to explore the hugely varied and complex predictors of adherence. Studies should focus on identifying change at the level of the individual rather than within populations as is the case with traditional RCT designs [14].

**Study limitations**

The approach adopted in this systematic review identified studies that were not specifically motivational interviewing but that could have a motivational or behavioural component as distinct from traditional patient education. Whilst the broad inclusion criteria ensured that no relevant studies were missed, arguably it resulted in four out of five studies being included that offered very little to the understanding of motivational and behavioural approaches for the prevention of diabetic foot ulceration.

A further limitation of the study is that one reviewer (JB) assessed the behavioural techniques against the validated taxonomy BCCTv1 from the intervention descriptions in the included studies [30]. Coding of behavioural techniques used in publications is not simplistic and its fidelity in this review could have been improved by a second reviewer independently coding techniques in order to reach a consensus on behavioural techniques adopted [30].

## Conclusion

There is insufficient evidence on whether motivational interviewing or aligned behavioural interventions are effective at enhancing adherence in order to prevent diabetic foot ulceration. Motivational interviewing has been found to be an effective intervention associated with positive behaviour change and adherence in other conditions [18,19,22]. More research is required in this area.

## Conflict of Interest

None to declare.

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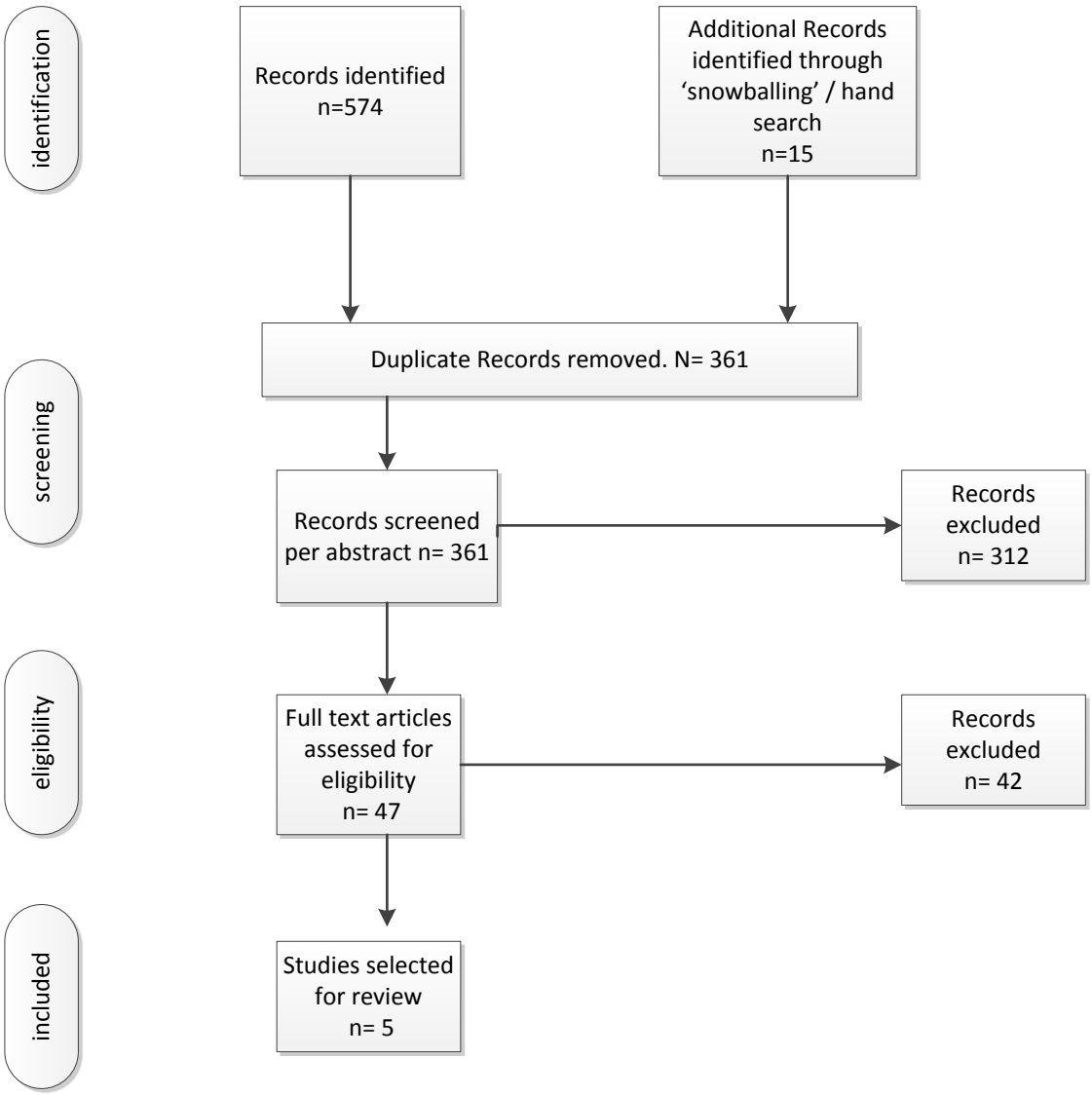
54. Ienca M, Fabrice J, Elger B, et al. Intelligent assistive technology for alzheimer's disease and other dementias: A systematic review. *Journal of Alzheimer's disease : JAD*. 2017;56(4):1301.

55. Martínez-Alcalá C,I., Pliego-Pastrana P, Rosales-Lagarde A, Lopez-Noguerola J, Molina-Trinidad E. Information and communication technologies in the care of the elderly: Systematic review of applications aimed at patients with dementia and caregivers. *JMIR rehabilitation and assistive technologies*. 2016;3(1):e6.

**Table 1. Motivational components of interventions required for inclusion.**

| **1. Interviewing / communication styles**<br>To be included one or more of the following interviewing techniques / communication styles needed to be described: | 2. **Process and Planning**<br>To be included one or more of the following processes needed to be described: |
|---|---|
| Patient centred / individualised (feedback)<br>Empathetic<br>Coaching<br>Affirming<br>Reflective listening<br>Engagement<br>Confidence / efficacy building | Providing feedback<br>Problem solving<br>Discussion on pros and cons of change decisional balance<br>Goal setting<br>Action planning<br>Readiness to change |

**Figure 1. A PRISMA diagram for numbers of studies identified, screened, reviewed and selected.**



## Table 2. Quality Assessment for Selected studies

| | McMurray (2002) | Corbett (2003) | Gershater et al. (2011) | McBride et al. (2016) | Keukenkamp et al (2017) |
|---|---|---|---|---|---|
| **Study design** | | | | | |
| 1. Are appropriate definitions included for the terms “ulcer”, “healing”, and all other required aspects of the population and the outcomes? | 0 | 1 | 0 | 0 | 1 |
| 2. Was the choice of study population appropriate for the chosen intervention and the stated conclusions? | 1 | 0 | 1 | 1 | 1 |
| 3. Was there a control population that was managed at the same time as those in the intervention group or groups? | 1 | 1 | 1 | 1 | 1 |
| 4. Is the intervention sufficiently well described to enable another researcher to replicate the study? | 0 | 1 | 0 | 0 | 1 |
| 5. Are the components of other aspects of care described for the intervention and comparator groups? | 0 | 0 | 1 | 0 | 1 |
| 6. Were the participants randomised into intervention and comparator groups? | 0 | 1 | 1 | 1 | 1 |
| 7. Were the participants randomised by an independent person or agency? | 0 | 0 | 0 | 1 | 1 |
| 8. Was the number of participants studied in the trial based on an appropriate sample size calculation? | 0 | 0 | 0 | 1 | 0 |
| 9. Was the chosen primary outcome of direct clinical relevance? | 1 | 1 | 1 | 0 | 1 |
| 10. Was the person who assessed the primary outcome or outcomes blinded to group allocation? | 0 | 0 | 0 | 0 | 1 |
| 11. Were either the clinical researcher who cared for the wound at research visits or the participants blinded to group allocation? | 0 | 0 | 0 | 0 | 1 |
| **Study conduct** | | | | | |
| 12.. Did the study complete recruitment? | 1 | 1 | 0 | 1 | 0 |
| 13. Was it possible to document the primary outcome in 75% or more of those recruited? | 1 | 1 | 0 | 1 | 1 |
| 14. Were the results analysed primarily by intention-to-treat analysis? | 0 | 0 | 0 | 1 | 0 |
| 15. Were appropriate statistical methods used throughout? | 1 | 0 | 1 | 0 | 1 |
| **Outcomes** | | | | | |
| 16. Was the performance in the control group of the order that would be expected in routine clinical practice? | 1 | 1 | 1 | 1 | 1 |
| 17. Are the results from all participating centres comparable? Answer “yes” if the study was done in only one centre. | 1 | 1 | 1 | 1 | 1 |
| **Study reporting** | | | | | |
| 18. Is the report free from errors of reporting—eg, discrepancies between data reported in different parts of the report? | 1 | 1 | 1 | 0 | 1 |
| 19. Are the important strengths and weaknesses of the study discussed in a balanced way? | 1 | 0 | 0 | 1 | 1 |
| 20. Are the conclusions supported by the findings? | 0 | 0 | 0 | 0 | 0 |
| 21. Is the report free from any suggestion that the analysis or the conclusions could have been substantially influenced by people with commercial or other personal interests in the findings? | 0 | 0 | 1 | 1 | 1 |
| **Risk of Bias TOTAL (out of a possible 21)** | 10 | 10 | 10 | 12 | 17 |

**Table 3. Characteristics of included studies**

| Author, year | Study design | Population | Intervention | Mode & duration of intervention | Follow up period | Outcome measures |
|---|---|---|---|---|---|---|
| McMurray et al. (2002) | Quasi | Type 1 or type 2 diabetes with end stage renal disease<br><br>N= 83 | Self management education, diabetes care monitoring and motivational coaching. | One to one.<br>Delivered 2-3 times weekly for subjects attending for haemodialysis in specialist centre.<br>Unspecified duration.<br>Delivered once a month for subjects attending for peritoneal dialysis in specialist centre.<br>Unspecified duration | 1 year | Knowledge<br>Quality of Life<br>Self management behaviours<br>Glycaemic control<br>Foot Risk<br>Amputations |
| Corbett (2003) | pilot | Type 2 diabetes at risk of ulceration without current or history of ulceration.<br><br>N=40 | Problem solving based on risk assessment and conversations tailored to individual. | One to one.<br>Delivered in 1 session at home visit<br><br>Duration of intervention is not specified. | 6 and 12 weeks | Knowledge<br>Self care practices<br>Self efficacy |
| Gershater et al. (2011) | RCT | Either Type 1 or Type 2 diabetes with previous ulceration – now healed<br><br>N=131 | Participant driven. Enquiry-led questions aimed to build self confidence | Group based. Two to five subjects per group. Men and women in separate groups.<br><br>Delivered in one session of<br>60 minutes duration at specialist centre | 6 months | Incidence of ulceration |
| McBride et al. (2016) | Pilot | Either Type 1 or Type 2 diabetes with current ulceration defined as slow to heal<br><br>N=56 | Decision Navigation. | One to one.<br>An initial telephone call then researcher attended with subject to their scheduled footcare appointment at specialist centre.<br><br>Duration of intervention is not specified. | 2 and 12 weeks | Decision self efficacy<br>Adherence to treatment<br>Decision conflict<br>Decision regret<br>Wound healing rate |
| Kaukenkamp et al. (2017) | Pilot | Either Type 1 or Type 2 diabetes with previous ulceration – now healed<br><br>N=10 | motivational interviewing | One to one.<br>Delivered over 1 or 2 sessions at specialist centre.<br><br>Mean duration of intervention = 53 minutes | 1 and 12 weeks | Measure of adherence to wearing footwear. |

**Table 4. Analysis of behavioural interventions used in studies as categorised against the BCTTv1** http://www.bct-taxonomy.com/ [30]

| Behavioural Change Techniques identified (ref BCCTv1) across included studies. | McMurray et al. (2002) | Corbett (2003) | Gershater et al. (2011) | McBride et al. (2016) | Keukenkamp et al. (2017) |
|---|---|---|---|---|---|
| **1.Goals and Planning** | | | | | |
| Goal Setting (behaviour) 1.1 | | | | | ■ |
| Problem solving 1.2 | ■ | ■ | ■ | | ■ |
| Action planning 1.4 | ■ | | | ■ | ■ |
| Discrepency between current behaviour and goal(s) 1.6 | | | | | ■ |
| Commitment 1.9 | | | | | ■ |
| **2.Feedback and Monitoring** | | | | | |
| Feedback on behaviour 2.2 | | | | | ■ |
| **3. Social support** | | | | | |
| Social support (unspecified) 3.1 | | | ■ | ■ | ■ |
| Social support (practical) 3.2 | ■ | ■ | | | |
| Social support (emotional) 3.3 | ■ | | | | |
| **4. Shaping knowledge** | | | | | |
| Information about antecedents 4.2 | | | | | ■ |
| **5. Natural consequences** | | | | | |
| Information about health consequences 5.1 | ■ | ■ | ■ | ■ | ■ |
| Salience of consequences 5.2 | | | | | ■ |
| **6. Comparison of behaviour** | | | | | |
| Social comparison 6.2 | | | | | ■ |
| **7. Associations** | | | | | |
| Prompts / cues 7.1 | | | | | ■ |
| **8. Repetition and substitution** | | | | | |
| Habit reversal 8.4 | | | | | ■ |
| **9. Comparison of outcomes** | | | | | |
| Credible source 9.1 | | | | | ■ |
| Pros and cons 9.2 | | | | | ■ |
| **15. Self Belief** | | | | | |
| Self talk 15.4 | | | | | ■ |

*only the 18 behavioural change techniques identified in the analysis are included in the table out of the 93 techniques validated in BCTTv1